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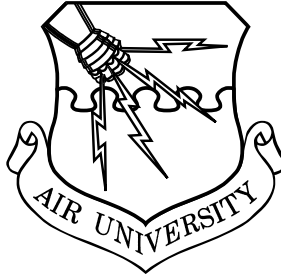
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Cleared to Engage
Improving Joint Close
Air Support Effectiveness

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Foreword

It is my great pleasure to present another of the *Wright Flyer Papers* series. In this series, the Air Command and Staff College (ACSC) recognizes and publishes our best student research projects from the prior academic year. The ACSC research program encourages our students to move beyond the school's core curriculum in their own professional development and in "advancing air and space power." The series title reflects our desire to perpetuate the pioneering spirit embodied in earlier generations of Airmen. Projects selected for publication combine solid research, innovative thought, and lucid presentation in exploring war at the operational level. With this broad perspective, the *Wright Flyer Papers* engage an eclectic range of doctrinal, technological, organizational, and operational questions. Some of these studies provide new solutions to familiar problems. Others encourage us to leave the familiar behind in pursuing new possibilities. By making these research studies available in the *Wright Flyer Papers*, ACSC hopes to encourage critical examination of the findings and to stimulate further research in these areas.



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Abstract

The importance of close air support (CAS) has markedly increased over the last five years in Operations Enduring Freedom and Iraqi Freedom. Ground forces have increasingly relied on the effects that airpower provides and will continue to do so in the foreseeable future. This has occurred while CAS doctrine and execution have undergone radical changes. While the fundamentals of a serviceperson with a radio calling in air support have remained relatively constant since World War II, the level of mission complexity has steadily increased. Digital communications, precision-guided munitions, collateral damage considerations, effects-based operations, and a “joint” battlefield have placed increased requirements on terminal attack controllers and CAS aircrew.

CAS has been a heavily debated topic within the services for decades. CAS doctrine and training issues have affected aircraft procurement, interservice relationships, and the application and effectiveness of airpower on the battlefield. This has produced numerous Congressional inquiries and service introspection on how to “get it right.” While much progress has been made since 2001, the services must continue to make CAS more effective. On the modern battlefield, the joint application of firepower is a reality, not a concept. It is time to “engage” the doctrinal and training challenges facing our services in order to increase the effectiveness of our aviation forces in the CAS arena.

Joint Close Air Effectiveness

Close air support (CAS)—the term evokes scenes from the movie *Platoon* where a ground commander is exhorting aircraft to “drop all remaining on my pos [position]” to avoid being overrun by enemy forces. In the current context, CAS has evolved into much more. This seemingly simple, yet complex, mission has been at the heart of airpower debates for decades. CAS, it can be argued, is the most difficult mission flown by an air platform on today’s battlefield.¹ CAS requires the highest level of integration with ground forces, indirect fires, and other assets.² In most cases, it also requires the greatest precision due to proximity to friendly forces. Finally, it has the highest potential for negative ramifications if something goes wrong, such as fratricide, civilian deaths, or the overrunning of ground forces.

The importance of CAS has markedly increased over the last five years in Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF). Ground forces have increasingly relied on the effects airpower provides and will continue to do so in the foreseeable future. The percentage of missions classified as CAS during Operation Desert Storm was 6 percent and zero in Operation Allied Force (due to no terminal attack controllers on the ground in Kosovo).³ In OEF and OIF, this increased drastically. During Operation Anaconda, nearly all such missions supported ground forces in the Shah-e-Kot Valley.⁴ During the push to Baghdad in 2003, 75 percent of Navy and Marine air involvement consisted of CAS missions.⁵ In the Central Command Air Force (CENTAF) report *OIF: By the Numbers*, 79 percent of targets struck during the campaign fell under the killbox interdiction/close air support (KI/CAS) category.⁶ In current operations in OIF, almost all air missions require positive control to engage ground targets.

Recent combat operations have also become increasingly joint in nature. For example, Air Force F-16s and Army AH-64s provide CAS for Marine battalions; Marine AH-1s support Army brigades; and Navy F-18s support special forces. This increased joint interaction, coupled with differences in each service’s approach to doctrine and training, has decreased the effectiveness of CAS.

The increased requirement for CAS, along with numerous problems noted during execution, prompted the Government Accounting Office (GAO) to submit a report to the Congressional House Committee on Armed Services on CAS training and equipment issues in May 2003. Several recommendations were provided in this report, many of which have been implemented.⁷ Joint CAS (JCAS) has also been one of the main areas of responsibility of Joint Forces Command (JFCOM) since 1999.⁸ While much attention has been focused on CAS and its intricacies, there are lingering issues that still inhibit the effectiveness of CAS. The question, therefore, is how do we overcome these remaining hurdles to increase CAS effectiveness and achieve a truly joint system?

Joint Publication (JP) 3-09.3, *Joint Tactics, Techniques, and Procedures for Close Air Support*, lists eight conditions for effective CAS: (1) effective training and proficiency; (2) planning and integration; (3) command, control, and communications; (4) air superiority; (5) target marking and acquisition; (6) streamlined and flexible procedures; (7) appropriate ordnance; and (8) favorable weather.⁹ Current doctrine and training issues impact all of these except air superiority and favorable weather. This paper addresses the question of improving CAS effectiveness by focusing on these two areas. Improvements in the services' approach to doctrine and training will enable airpower to become more effective at CAS. Service differences in the approach to doctrine and training are a key limiter in JCAS execution. Problems in these areas will be highlighted with recommendations on how the military can improve the current JCAS construct and increase battlefield effectiveness.

Close Air Support Doctrine

Doctrine—Fundamental principles by which the military forces or elements thereof guide their actions in support of national objectives.

—Joint Publication 1-02
*Department of Defense Dictionary
of Military and Associated Terms*

CAS has its roots in the early decades of the twentieth century. The advent of the airplane quickly led to its application in strafing and bombing on the European battlefields in World War I. Marine aviators developed a form of CAS in the 1927 Nicaraguan civil war.¹⁰ These early uses of airpower in support of ground troops gradually matured through World War II, Korea, and Vietnam to the doctrine we have today.

Service viewpoints on CAS diverged after World War II. Many Air Force proponents viewed airpower in broader terms based on the results of strategic bombing during the war. CAS was deemed “a maximum waste of firepower” by Air Force leadership.¹¹ The Army viewed airpower in terms of supporting a ground campaign. These viewpoints have continued within the two services in some form to the present day. The Key West Agreement of 1948 attempted to clarify service relationships while also tasking the Air Force to provide CAS to the Army.¹²

The underlying tension regarding the two services’ differing viewpoints on CAS affected interservice relationships and aircraft procurement throughout the 1960s. The Johnson-McConnell Agreement of 1966 further delineated the Air Force’s role as the sole provider of fixed-wing CAS to the Army, while recognizing that Army helicopter missions included fire support.¹³ This agreement, along with the subsequent 1975 letter outlining the Air Force and Army understanding of airpower use, shaped the Army’s doctrinal stance on CAS that has continued to this day.¹⁴ Army leaders first used the term *direct aerial fire support* to describe helicopter CAS and attached a definition that would not antagonize the Air Force: “fire delivered by aerial vehicles organic to ground forces against surface targets and in support of land operations.”¹⁵ This evolved into *close in fire support*¹⁶ and, currently, *close combat attack*.

The United States Marine Corps views CAS through a much different lens. The Marine approach to warfare stresses combined arms fires. Aviation fires have been an integral part of the plan since the development of CAS tactics 80 years ago during campaigns in Latin America. In 1935 the Marine Corps established aviation as an independent section “primarily for the support of Fleet Marine Forces in landing operations and in support of troop ac-

tivities in the field.”¹⁷ Indeed, the construct of combat units is based on the Marine Air Ground Task Force (MAGTF), where an aviation element is tasked to provide support to ground forces. This air-ground approach endured due to a historically lighter force. Marine units typically deploy with fewer artillery assets than the Army because of their amphibious background. This has cemented the requirement for aviation fires to provide that additional support. Additionally, Marine aviation historically focuses on the tactical level. Having no strategic bombers, the Marine Corps avoided the debate within the Air Force on the most efficient application of airpower. However, this contributes to problems with joint integration, as Marine leadership is constantly at odds over the right mix of providing aircraft for a joint air campaign while maintaining the direct support capability of Marine aviation upon which the MAGTF was established.

Current Close Air Support Doctrine

JP 3-09.3 governs CAS procedures. The JCAS publication, revised in 2003, has two major conflicts from which to draw lessons learned. Current doctrine has addressed many problems that were inherent with the old “positive control” and “reasonable assurance” doctrine. Many of the problems that remain, however, deal with different service approaches to CAS and understanding of the doctrine.

First are the Air Force and Army approaches to CAS. Service parochialism significantly motivates the differing viewpoints. The argument of whether or not CAS constitutes an effective use of airpower is beyond the scope of this paper. The underlying debate, however, drives both services’ mindset and approach to the mission.

Helicopter development provided Army ground commanders with an organic air platform to provide fire support.¹⁸ This fire support was deemed necessary due to a perceived lack of support from the Air Force, whose focus was on the strategic bombing mission. This development, unfortunately, also involved the use of semantics and wordsmithing to avoid an “encroachment” on the Air Force’s responsibility of providing CAS to the Army. This tit for tat over CAS has resulted in an almost superstitious avoidance of using

the term within Army circles or implying that Army aviation performed the mission. A letter from the Army and Air Force chiefs of staff to the chairman of the House Armed Services Committee in September 1975 defined the role of the attack helicopter as “integral to the Army ground maneuver unit and . . . an extension of organic firepower.” The two services agreed “the attack helicopter does not perform CAS but is intended to complement Air Force CAS capabilities.”¹⁹ Army helicopters do conduct CAS, but under the guise of calling it another name. The following is an excerpt from the Army’s Field Manual (FM) 3-04.111, *Aviation Brigades*, dated August 2003, regarding close combat attack (CCA):

For aviation units, close combat attack (CCA) is defined as a hasty or deliberate attack in support of units engaged in close combat. During CCA, armed helicopters engage enemy units with direct fires that impact near friendly forces. Targets may range from a few hundred meters to a few thousand meters. CCA is coordinated and directed by a team, platoon, or company-level ground unit using standardized CCA procedures in unit SOP [standard operating procedures].

Effective planning, coordination, and training between ground units and armed aircraft maximize the capabilities of the combined arms team, while minimizing the risk of fratricide. The key to success for enhancing air/ground coordination and the subsequent execution of the tasks involved begins with standardizing techniques and procedures. The end state is a detailed SOP between air and ground maneuver units that addresses the CCA situation. This procedure is best suited for units that maintain a habitual combined arms relationship during training and war.

The CCA briefing follows the joint standard nine-line format with minor modifications for Army helicopters. The briefing provides clear and concise information in a logical sequence that enables aircrews to employ their weapons systems. It also provides appropriate control to reduce the risk of fratricide.

Before the armed helicopter team engages, the target must be confirmed by the aircrew and friendly unit in contact. During engagement, open communication and continuous coordination with friendly ground elements are required to ensure the desired effect. Coordination of the direct and indirect fires from all participants produces the most efficient results in the least amount of time, with the least risk to all. This coordination includes CAS and any non-lethal methods that may be employed.²⁰

Compare this excerpt with the current JCAS definition of CAS: “air action by fixed- and rotary-wing aircraft against hostile targets that are in close proximity to friendly forces and that require detailed integration of each air mission

with the fire and movement of those forces.”²¹ CCA goes so far as to utilize the JCAS nine-line briefing format that is the accepted standard, but instead calls it the “close combat attack briefing.”²²

This approach had minimal impact on joint operations prior to OEF and OIF, when Army helicopter units generally supported only Army ground units. After 9/11, however, Army attack helicopters have provided CAS for special forces and Marine ground units. Army pilots encountered problems because they were not well versed in CAS procedures as outlined in JP 3-09.3.²³ Command and control and forward air controller procedures were adjusted when AH-64s supported Marine units based on this doctrinal issue.²⁴

On the Air Force side, there is a persistent perception that CAS is a lower-priority mission or a less-effective use of airpower than interdiction or strategic bombardment.²⁵ Current Air Force doctrine perpetuates this perception. Air Force Doctrine Document 2-1.3, *Counterland Doctrine*, states that the “benefits of CAS must be weighed against the other, potentially more effective, uses for CAS-capable assets such as air interdiction (AI) or even strategic attack.”²⁶ This approach inhibits effectiveness because units spend less time on training for CAS. This viewpoint, in some cases, gives pilots the false impression that CAS is somehow a less complex mission than other mission taskings they routinely practice. Prior to OEF and OIF, this was not a big issue as A-10 aircraft provided the preponderance of CAS sorties and were generally well versed in CAS procedures. Other Air Force assets did not execute the mission as often and rarely flew in support of other services on missions involving CAS. Technology and an increase in CAS taskings have changed this drastically during OEF and OIF. Advances in weapons and sensors allow many different aircraft to perform the CAS mission. Nearly all fixed-wing platforms capable of dropping a bomb have been employed in a CAS role, to include B-52 and B-1 strategic bombers.

This shift in CAS support coming from other aircraft traditionally not tasked for the mission has resulted in aircrews supporting the mission that have little or no understanding of the ground scheme of maneuver or intricacies of an integrated fire-support plan. A common approach seen in these situations is the “bomb on coordinate” mentality. The aircrew fo-

cuses on target coordinates for a precision-guided munitions delivery and misses the importance of an assigned final attack heading or a time on target (TOT), which to the ground unit or controller is also a critical piece of the mission. Perhaps the final attack heading was given to keep the aircraft from delivering ordnance over the top of friendly positions, or the TOT was assigned because helicopters are landing in a zone near the target one minute after bomb impact.²⁷

Doctrinal differences concerning CAS and fire-support coordination measures are also a factor. Much discussion and research have been accomplished on the fire support coordination line (FSCL) emplacement and utility. The FSCL discussion is also beyond the scope of this paper; however, it does impact the effectiveness of CAS. Nowhere in the JCAS manual does it state that CAS is tied to a specific fire-support-coordination measure. Specifically, it says that the FSCL “does not divide an area of operations by defining a boundary between close and deep areas or create a zone for CAS.”²⁸ Misunderstanding of this basic CAS premise has put undue restrictions on aviation fires and unnecessarily required CAS control for missions that meet the definition of interdiction. Understanding of what CAS “is” and “is not” still varies within the branches.²⁹ Briefs given at the 2004 JCAS conference described Scud-hunting missions in the western desert of Iraq during OIF as CAS.³⁰ Confusion over the difference between CAS, interdiction, and terminal guidance operations has also led to recommendations to call operations something else, such as battlefield air interdiction or ground-aided precision strike.³¹

Another shortfall of current CAS doctrine is it focuses almost exclusively on fixed-wing tactics, techniques, and procedures (TTP). Six pages in the current JCAS publication are allotted to cover rotary-wing CAS employment, control points, tactics, and weapons. This is due, in part, to the fact that the Army, while owning the preponderance of helicopters in the military, does not conduct CAS or forward air controller (airborne) (FAC[A]) missions. However, Marine Corps attack helicopters routinely execute these missions. During Operation Anaconda, Marine Cobra helicopters were underutilized in the FAC[A] and strike coordination and reconnaissance (SCAR) role due to a lack of understanding within the joint task force (JTF) chain of command of the

helicopter's capabilities.³² This is through no fault of the Army commanders whose exposure to rotary-wing attack aviation in most cases was limited to AH-64s, which do not routinely perform those missions. Target sets during Anaconda included cave entrances and camouflaged bunkers in rugged terrain. These targets were often very difficult to acquire from fixed-wing aircraft and intelligence, surveillance, and reconnaissance (ISR) platforms operating at medium-to-high altitude. Low-altitude platforms such as helicopters were ideal for target location in this instance. This lack of knowledge of helicopter CAS and FAC[A] capabilities leads to inefficiency in employment of rotary-wing assets. This problem also affects training, as service FAC[A]s (with the exception of the Marine Corps) rarely control helicopters during FAC[A] training.³³

There is also a lack of understanding of current types of CAS control and employment of FAC[A] platforms by ground commanders. Change 1 to the JCAS publication disseminated in September 2005 attempted to clarify the definitions and procedures for the three types of CAS control.³⁴ This has helped, but there are still occasions where ground commanders remain hesitant to use Type 2 or 3 control due to a perceived increase in risk. Commanders have also been hesitant to employ FAC[A] platforms due to a lack of familiarity or a developed relationship with a particular unit or platform.³⁵

Technology has had a dramatic impact on doctrine. CAS doctrine has not been able to keep up with the pace of technological advancements. The increased use of precision-guided munitions (PGM) has shifted how air attacks are executed during CAS. The increased stand-off and delivery ranges of PGMs, such as the Hellfire missile or Joint Direct Attack Munition (JDAM) in many cases, require a ground controller to authorize a pilot to deliver the weapon without first seeing his or her aircraft. In some cases, the pilot may not acquire the target prior to weapons release. This requires a higher level of confidence by the ground commander in his or her air controller and the CAS platform.

Use of video feeds such as the remotely operated video enhanced receiver (ROVER) has also affected CAS doctrine.³⁶ Joint terminal attack controllers (JTAC) can now view unmanned aerial vehicles (UAV) and aircraft sensors

on a computer screen to aid in targeting. This has both benefits and drawbacks. JTACs no longer have to see the target with their eyeballs to engage it, and in many cases, no longer have to be in the same geographic location as the target. Unfortunately, in some cases, this has led to micro-management of tactical attacks by the chain of command.³⁷ Commanders now have a bird's eye view of an engagement and feel the need to step in vice letting the tactical operators execute the mission based on their knowledge of the situation. CAS doctrine is a step behind on this issue and has not addressed it sufficiently.

Tied to this problem is the increasing use of UAVs during CAS. UAV usage has far outpaced the ability to define doctrine and TTPs for these systems during CAS missions. The growing proliferation of these systems has many ramifications for CAS, to include clearance of fires, UAV control authority, airspace deconfliction, and target handoff, just to list a few.

Airborne target coordinate generation/designation and digital communications are two other areas that doctrine must sufficiently address. Advanced targeting pods have provided greatly increased capability to many platforms. In some cases, these pods are capable of obtaining extremely precise coordinates for weapons such as JDAM. Currently, there is limited data and information on the capabilities of the several different pods and the fidelity of these systems on specific platforms.³⁸ The Air Force developed some information on its systems, but other services have not. Digital communication TTPs are also lacking in current doctrine. There are several systems in operation, each with its own requirements and procedures. The JCAS publication provides some basic procedures for digital CAS, but falls short of the detail needed.

Technological advances, in many cases, have increased the effectiveness and efficiency of CAS; however, the requirements on terminal attack controllers have also increased. The JTAC is no longer the person seeing the target or marking the target. He or she may be coordinating target acquisition through one air platform via a video feed while another aircraft marks the target via a laser designator. He or she may be delivering clearance to fire via a computer keystroke instead of talking on a radio. Doctrine currently

lacks the detail that allows him or her to harness this technology most efficiently during CAS.

Many of the doctrinal problems outlined affect CAS training as well. CAS training has varied between the services and between conflicts. Standardization has occurred for terminal attack controllers, but there are many areas in CAS aircrew training that need improvement.

Close Air Support Training

In professional sports, teams do not develop a game plan during practices and then execute something completely different on game day. Teams may have to make adjustments based on their opponent, but they still execute the basic procedures of their game plan. In CAS operations, however, aircrews and controllers often improvise during execution based on a lack of practice or training in CAS procedures. All members of the military have heard the oft-repeated expression: “train like you fight and fight like you train.” Nowhere is this more important than in CAS. The JCAS publication lists effective training and proficiency as one of the eight conditions for effective CAS.³⁹ Several initiatives have been incorporated over the last five years that attempt to standardize JCAS training. The JTAC Memorandum of Agreement (MOA) signed in 2004 standardized CAS training for terminal attack controllers at the service schoolhouses.⁴⁰ The joint forward air controller (airborne) (JFAC[A]) MOA does the same for services and platforms that conduct the FAC[A] mission.⁴¹ This training standardization has focused on the terminal-controller end of CAS. CAS aircrew standardization varies between services and units; thus there are still hurdles to overcome in CAS training to make it more effective.

The first hurdle is the lack of joint training. This was one of four main areas for improvement highlighted in the GAO report on military readiness in May 2003.⁴² Recent initiatives, such as the joint national training capability by JFCOM, are attempting to address this problem.⁴³ While this is a good first step, service-specific taskings and lack of a central authority to oversee joint training continue to be a problem. Training requirements and high operational tempo often force units to forego joint training in lieu of

higher-priority taskings within their own service. Additionally, while JFCOM is a joint training facilitator and can provide incentives, such as funding for exercises, they hold no authority to compel units to participate. Thus, while units such as an Army Attack Aviation battalion may know that they will be supporting Marine infantry units in Iraq, geographic location within the continental United States and limited training time may prevent them from conducting joint training prior to deployment. This is a problem even within the Marine Corps, which generally performs air-ground integration well. There is a tendency to train with Marine air platforms rather than other service aviation assets due to a familiarity between Marine air and ground units.⁴⁴ This inhibits Marine controllers and aircrews from becoming more knowledgeable and familiar with joint air assets that they might work with in-theater.

Another hurdle is the lack of emphasis within some units on CAS training. Some unit commanders have focused unit training on other mission sets, such as air-to-air training or interdiction, despite the low probability of these missions occurring, especially in current Iraqi operations.⁴⁵ While it is understood that units must maintain proficiency and competency in all unit taskings and missions, it is unfathomable to neglect training in one of the most likely areas of employment in-theater.

The fluidity of recent operations also in some ways contributes to CAS training issues. Many sorties during the Iraqi ground campaign in 2003 were rolled to provide CAS from other mission taskings once airborne. This prevented effective premission planning and integration from being conducted, another listed condition for effective CAS.⁴⁶ This has perpetuated the mind-set that CAS is a pickup mission that can be executed on the fly; thus less emphasis is placed on it in the training environment.

The previously mentioned Air Force and Army mind-sets toward the mission are at the core of CAS training issues. Air Force emphasis on other missions, such as strategic attack or interdiction, tacitly allows squadrons to focus on these areas during training instead of CAS. The Army's refusal to acknowledge that their attack aviation assets conduct CAS provides them with a loophole to forego CAS training.

Other external requirements also impact training. The Army restructuring has placed greater demands on the Air Force for terminal attack controllers.⁴⁷ More controllers mean more training requirements with the same amount of aviation support. The Marine Corps faces a similar situation with the stand up of the single-seat FAC[A] program within fixed-wing units.⁴⁸

Technology has also played a part in inhibiting CAS training. Advances in weapons and sensors have outpaced doctrine. In many cases, this forces CAS aircrews and controllers to develop ad hoc TTPs. Failure to capture TTPs at a central point and disseminate them leads to varying degrees of proficiency and different procedures from unit to unit.⁴⁹ In some cases shortages of systems, such as advanced targeting pods, preclude aircrews training with them prior to deployment, which can lead to less effective use during CAS operations in-theater. Technology has also impacted range training due to the fact that range regulations have not kept up with the pace of precision-guided munitions and CAS control procedures. This unnecessarily restricts ground and aviation units from training effectively.

The issues outlined in doctrine and training have in most cases not prevented US forces from receiving CAS. The United States is without a doubt the world leader in applying military power, and this holds true in CAS as well. The implementation of the following recommendations will increase effectiveness across all services and make CAS truly joint.

Recommendations

Knowing is half the battle.

—GI Joe

Discussion of an issue without a recommendation is merely a history lesson. Each service has its own CAS shortfalls to work through with the goal to make a more effective product for the user—the serviceman or servicewoman on the ground.

Doctrine

Many of the CAS issues outlined have been highlighted in other theses, articles, and books. Recommendations in this

thesis focus on the areas of doctrine and training highlighted at the beginning and address the specific issues outlined.

1. Acknowledgement by Air Force and Army Headquarters that Army Attack Aviation Performs Close Air Support

This recommendation lies at the heart of the Air Force and Army's relationship regarding CAS. Employment of airpower in combat has continued to evolve over the last three decades since the two services agreed that attack helicopters "do not perform CAS."⁵⁰ It is reprehensible to allow such a myopic view to continue forward in light of continued proof. Otherwise, both services readily agree that the Army relies on external support for fixed-wing CAS, and the preponderance of this support comes from the Air Force, based on historical precedent and agreements. It should also be agreed upon that the attack helicopter is a viable platform for providing CAS as demonstrated for over 35 years by the Marine Corps and by the Army in recent operations in OEF and OIF. Acceptance of this fact in no way impacts each service's mission sets or support. Army attack aviation can still perform as maneuver elements and conduct other missions such as deep attack. This proposal merely formalizes what is already happening. This would also require a change in Army doctrine that would remove CCA as a mission and incorporate CAS. A method to do this is to make the JCAS publication the service CAS doctrine. This is what occurred within the Marine Corps in 2003. Prior to 2003, the Marine Corps published Marine Corps Warfighting Publication (MCWP) 3-23.1, *Close Air Support*.⁵¹ With the publication of the updated JCAS manual in 2003, the Marine Corps rescinded MCWP 3-23.1 and now solely references JP 3-09.3 for CAS. Acknowledgement that the Army does CAS is crucial because Army aviation is actively involved in providing CAS to Army, Marine, and Special Forces units in OIF and OEF. This requires pilots to be trained and familiar with CAS procedures. A Casey-Moseley agreement⁵² similar to Johnson-McConnell or the one between Gen David C. Jones, Air Force chief of staff, and Gen Frederick C. Weyand, Army chief of staff, in 1975⁵³ would reaffirm the Air Force's

commitment to providing fixed-wing CAS for the Army, while acknowledging that Army attack aviation has a role in CAS and FAC[A].

2. Stand up an Army FAC[A] Program

- a. An Army rotary-wing FAC[A] program offers many advantages. It would provide Army commanders with an increased capability to call in aerial fires. FAC[A]s are trained and operate under standardized procedures as outlined in the JFAC[A] MOA. As the Army restructures under the brigade concept, having this capability could ease the requirement for additional JTACs. This would also aid in familiarizing Army pilots in CAS TTPs. Army attack aviation has practiced many FAC[A] functions for years under the joint air attack team (JAAT) concept.⁵⁴ In Vietnam, controllers routinely flew in Army helicopters. More recently in Iraq, terminal attack controllers were put in the right seat of OH-58 scout helicopters of the 101st Airborne Division.⁵⁵ The Marine Corps already employs its Cobra and Huey helicopters as rotary-wing FAC[A]s.
- b. Proof of concept training occurred in January 2006, when four AH-64D pilots from the 1st Battalion, 227th Attack Regiment, received FAC[A] familiarization training. The FAC[A] academic course, taught by the Expeditionary Warfare Training Group Pacific, provides academic instruction and field training for all Marine forward air controllers and FAC[A] aircrews. The pilots then spend two weeks flying rotary-wing FAC[A] missions with Marine Aviation Weapons and Tactics Squadron One (MAWTS-1). MAWTS-1 provides tactical standardization and advanced-level training for all Marine Corps aviators. MAWTS-1 AH-1W FAC[A] instructors flew in AH-64D aircraft and provided live-fire instruction in rotary-wing FAC[A] procedures. The pilots on average executed 32 fixed-wing controls of Air Force and Marine jet aircraft. The conclusions affirmed that the AH-64 is an extremely viable and capable platform to conduct FAC[A] and that senior Army attack pilots proficiently conducted

FAC[A] following the academic and live-fire training.⁵⁶ The current hurdle for the Army is determining whether it should develop a formal FAC[A] program for Army aviation. Granted, there are support issues that must be addressed before this happens, but the decision should be made on the honest analysis of the increased capability that the program would bring to Army ground forces and not traditional rice bowls of the mission within the services.

- c. Many of the requirements are already in place to make the program happen. The Army is already a signatory of the JFAC[A] MOA, which outlines certification standards and requirements. Rotary-wing FAC[A] TTPs are already established and used by attack helicopters within the Marine Corps and could be quickly incorporated into Army aviation doctrine and publications.⁵⁷ Initial training of Army pilots could leverage Marine Corps rotary-wing FAC[A] instructors at MAWTS-1, under a “train the trainer” concept, to stand up an initial cadre of Army FAC[A] instructors who could then continue the training for Army units.

3. Services Place Greater Emphasis on the Close Air Support Mission

Emphasis on the CAS mission has improved since 9/11; however, the advent of advanced sensors and PGMs thrusts many platforms into the CAS role in combat without a solid foundation of CAS training. Standardization initiatives have focused on the terminal attack controller and neglected aircrews and units performing CAS. This is most needed in units that have just recently begun employing their platforms in the CAS role and have traditionally been focused on other missions. Emphasis on the mission by service headquarters will drive these units to increase their focus on CAS, thereby increasing standardization and effectiveness.⁵⁸

4. Institute Changes in Services’ Doctrinal Approach to Fire Support Coordination and Close Air Support

The lessons learned from CAS operations supporting V Corps and I Marine Expeditionary Force (MEF) dur-

ing OIF show joint air operations were more effective in I MEF's area of operations.⁵⁹ Personnel manning the battlefield coordination detachment, air support operations center, or direct air support center must have a thorough understanding of what CAS "is" and "is not," and how management of fire-support coordination measures and fires is critical to the effectiveness of CAS. Ground commanders at all echelons must understand that CAS employment principles are crucial to the effectiveness of air-delivered fires.⁶⁰

5. Expand Detail in Close Air Support Doctrine on Helicopter Tactics, Techniques, and Procedures

Expansion of Army attack aviation into CAS and FAC[A] roles requires more detail incorporated into CAS doctrine on helicopter TTPs. Knowledge of helicopter CAS TTPs varies greatly within fixed-wing units and the services. Marine fixed-wing attack pilots generally are the most knowledgeable regarding helicopters due to a habitual relationship with rotary-wing units within the MAGTF construct. Lack of its own attack helicopter assets limits Air Force exposure to helicopter employment during CAS, although some units are familiar with Army attack helicopter TTPs based on JAAT operations.⁶¹ Other units' experience, however, is limited to academic classes and simulation of rotary-wing assets during FAC[A] and CAS missions.⁶² A concerted effort must be made to incorporate more information and TTPs regarding helicopter operations into doctrine. The JCAS publication is the best source and has a wider dissemination than service-specific manuals.

6. Promote Better Understanding of Close Air Support Control Types and Forward Air Controller (Airborne) Utilization by Ground Commanders

A better understanding by ground commanders of the types of CAS control and utilization of FAC[A] platforms benefits CAS effectiveness. Over the last five years, understanding of the types of CAS control and their application has improved. Continued education and inclusion of ground commanders in JCAS will improve that

process. Offering a CAS “primer” course at the services’ commanders courses would better familiarize incoming commanders with JCAS and FAC[A] TTPs.⁶³ Greater integration of ground officers into forums such as the JCAS and JFAC[A] conferences would prove beneficial, since their participation at these two conferences is usually limited. Most participants are from aviation or terminal-controller backgrounds.

7. Incorporate Latest Close Air Support Tactics, Techniques, and Procedures with Regards to Technology

Finally, CAS doctrine must catch up to technology. There is a wealth of field expertise from CAS aircrews and controllers who have developed procedures out of necessity in combat that need to be filtered and codified into JCAS doctrine. TTPs must be expanded in detail on PGM targeting and delivery, video feed usage, and UAV integration. Subject-matter experts at the Joint Unmanned Aerial Systems Center of Excellence at Creech AFB in Indian Springs, Nevada,⁶⁴ must stay engaged in incorporating UAV TTPs into CAS doctrine.⁶⁵ There needs to be continued discussion on the UAV role in CAS, to include possible joint fires observer and/or FAC[A] training for UAV operators. Digital communication TTPs are constantly evolving as well. Incorporation of the latest information into JP 3-09.3 will ensure a baseline level of knowledge reaches all controllers and aircrews rather than remaining at a unit or service level.

Training

The more you sweat in peace, the less you bleed in war.

—Hyman G. Rickover

Commanders and units must constantly emphasize training that routinely exercises CAS tactics, techniques, and procedures. Successful CAS training will result in safe and effective CAS employment.

—Marine Corps Warfighting Publication 3-3.1
Close Air Support

Doctrinal changes will have little effect unless accompanied by improvements in training. Joint training does occur to varying degrees, but it is on an ad hoc basis and most times through the buddy system via phone conversation or e-mail between squadrons. For example, Marine Cobra squadrons may call an Air Force F-16 squadron and set up CAS sorties to fulfill AH-1W FAC[A] training. While this accomplishes the training requirements of the squadron, it is an informal method and neither squadron gets credit for joint training. The lack of joint training can be approached in many ways.

1. Establish a Joint Training Requirement

- a. The idea of levying an additional requirement on units would not be a popular one based on the current services' operations tempo and deployment cycles; but, realistically, it would allow units to increase joint interaction. It is critical, however, to apply a common-sense approach to minimize the impact on overburdened units. Geographic location is a major consideration. Aligning units to joint training opportunities within reasonable distance to their home station would be ideal.
- b. Joint tasking requirements should also be a key factor in determining unit participation. For instance, Marine rotary-wing units that will operate in an Army area of operations should align to train with Army brigade combat teams (BCT) that will be there during the same period. In December 2005, an Army National Guard UH-60 squadron was tasked to deploy to OIF in support of the 3rd Marine Aircraft Wing and to participate in Desert Talon, a Marine Corps predeployment training exercise in Yuma, Arizona.⁶⁶ This joint training should also count towards service-specific predeployment training requirements.
- c. This recommendation requires expansion of the Air Force-sponsored Integrated Training Initiative.⁶⁷ While this initiative includes joint training opportunities, it is Air Force-centric and needs increased participation from the other three services. Align-

ment of units to joint exercises based on mission requirements and deployment cycles would greatly increase the effectiveness of units conducting JCAS operations. Additional benefits include meeting the increased requirements for training of CAS controllers and FAC[A] aircrews. By aligning units based on training requirements, you get more “bang for the buck” and provide a more efficient use of aviation assets during training.

2. Increase Joint Interaction between the Services’ Weapons Schools

Joint interaction at the services’ weapons schools has improved in recent years, but participation is often limited to high demand/low-density platforms such as the Airborne Warning and Control System (AWACS), Joint Surveillance Target Attack Radar System (J-STARS), or EA-6B Prowlers. Joint CAS aircraft participation should be increased and include conferences on tactics and lessons learned. The JCAS and JFAC[A] conferences are excellent joint forums for discussing TTPs and lessons learned, but greater interaction at the tactical level during other forums such as the Air Force weapons and tactics conference (WEPTAC) would be ideal.⁶⁸ Platforms from all services would benefit from many of the CAS and FAC[A] lessons learned and TTPs at a joint WEPTAC. Cross-training of service CAS and FAC[A] subject matter experts is also extremely beneficial. Familiarization flights with other service CAS or FAC[A] platforms provide great benefit to all involved.⁶⁹ This joint interaction gives greater understanding of the employment TTPs of different platforms, sensors, and weapons, which leads to more efficient execution the next time those two platforms or units work together.

3. Establish Close Air Support Mission Essential Task List and Incorporate into Training of all Aircraft Performing the Mission

A baseline CAS mission-essential task list (METL) should be established similar to ones established for JTAC and JFAC[A] training.⁷⁰ This baseline level of CAS knowledge would increase the effectiveness of

CAS platforms by laying the framework of what is expected from a CAS platform by a terminal controller. Much of this standardization is already in place with the JTAC and JFAC[A] MOAs. Service and platform CAS experts can modify the existing standards to define the aircraft-specific requirements, including UAV controllers who provide fires in support of CAS. Leveraging current CAS syllabi from like fixed- and rotary-wing platforms will provide information for units expanding or creating a CAS training syllabus.

4. Elevate the Importance of Close Air Support in the Air Force

The Air Force must attach greater importance to the CAS mission than it has historically. In the past, issues arose over the capabilities of aircraft to perform the CAS mission. Advancements in targeting pods and precision weapons now allow many different aircraft to acquire and engage targets in support of a CAS mission, but CAS training has not advanced with these capabilities. Until CAS is regarded as a mission of at least equal importance with air interdiction or strategic attack, units will view it as a secondary mission and attach less importance to training for it.⁷¹ Many platforms have missions that focus on areas beyond CAS, but some baseline of standardized training is needed for each platform to perform effectively in the CAS role. As US military doctrine moves toward lighter and more maneuverable ground forces, the requirement for airpower to provide CAS continues to increase. This has been borne out in OEF and OIF.

5. Incorporate Close Air Support Training into Army Attack Aviation Training Syllabi

The Army mind-set toward CAS training must also change. An increase in training must accompany acceptance of CAS as a rotary-wing aviation mission. Training syllabi for OH-58 and AH-64 pilots must incorporate CAS academics and flight training. Stand-up of a FAC[A] program also requires more training. Current training on CCA can be adjusted to incorporate JCAS procedures. Marine AH-1W and UH-1N syl-

labi can be reviewed to develop a satisfactory syllabus to sufficiently prepare Apache and Kiowa pilots in CAS and FAC[A] TTPs.⁷²

6. Create an Army Weapons School

- a. Currently, Army aviation standardization resides at Fort Rucker, Alabama, with the Directorate of Evaluation and Standardization (DES), while the Directorate of Training and Doctrine is responsible for doctrinal literature and standardization of tactical operations.⁷³ The Army has no weapons and tactics course where pilots receive advanced training. These “patch wearers” in the other services are considered the subject-matter experts of weapons and tactics for their respective platforms.⁷⁴ The Army has a wealth of knowledge and experience in its aviation corps, but the lack of a weapons and tactics “center of excellence” prevents the Army from effectively harnessing and institutionalizing this pool of knowledge.
- b. This proposed “Army Aviation Weapons and Tactics Squadron (AAWTS)” could be based on a construct similar to MAWTS-1, the Marine Corps weapons school. Army helicopter missions most closely align with the Marine Corps, so this would be a logical choice. While DES would still be responsible for unit and pilot flight standardization and training, AAWTS would assume responsibility for the tactical standardization and advanced-level training of Army aviation. This would include functions similar to what MAWTS-1 performs: advanced-level training such as FAC[A], tactical publication production, doctrine input, and test and evaluation of emerging technology or procedures.
- c. The Army’s Yuma Proving Ground (YPG) complex in Arizona would serve as an ideal location for AAWTS. It provides access to several aviation training ranges for flight instruction and is centrally located to the Air Force Fighter Weapons School at Nellis AFB in Las Vegas, Nevada; Luke AFB in Phoenix, Arizona; the Marine Corps Air Ground Combat Center in

Twentynine Palms, California; and MAWTS-1 in Yuma, Arizona. This location would allow AAWTS to leverage the Air Force and Marine Corps weapons schools as it stood up. Additionally, the location promotes synergy by increasing joint training for all services. The AAWTS instructor courses would provide the ability for Army helicopters and aircrews to participate in joint training during Marine weapons and tactics instructor courses or Air Force fighter weapons school courses. This concept could easily be integrated into the JFCOM's Joint National Training Capability. The benefits of standing up AAWTS reach beyond Army aviation and would positively affect all services.

7. Address Technological Impact on Training

Technology can have both a positive and negative impact on training. Advancements allow aircrews and controllers to perform functions faster and better. If service personnel do not have exposure to that technology during training, it may negate its positive effect in combat. Service procurement programs will always pursue different systems based on specific requirements, but all should pursue common capabilities to increase the effectiveness of JCAS. At a minimum, this should include a video link capable of transmitting and receiving, an interoperable digital communications capability, and continued procurement of precision weapons capable of employment on a variety of target sets under varying conditions. Greater interaction among the services will also pay dividends in this arena. Familiarity with other services' weapons and sensor systems will not only increase effectiveness when employing those systems, but may be of benefit to a particular service (e.g., UAV employment with Block III AH-64Ds and the tactical video link on the AH-1W).⁷⁵

Conclusions

Close air support is good for your morale; it's really, really bad for the enemy's. I think the confidence of the 0311 that's behind the mortar hole,

with RPGs [rocket propelled grenades] (bouncing) off sandbags, I think it's good for him when a five hundred pound bomb drops in the vicinity of where he was just taking fire. It's certainly good at the company level and it's certainly good at the battalion level, as in, 'we're in control here, we can take this over at any time we want to.' HUMINT [human intelligence] reports were (that) it was devastating, absolutely devastating to them.

—Interview with 22-MEU FACs, 5 Jun 2004

The United States is without peer in the CAS arena. The nation's foes truly fear the capabilities of our airpower more than our ground forces. The evolution of warfare since Desert Storm has thrust CAS into an increasingly prominent role on the battlefield. This increased requirement is being met by expanding joint support across the services. Marine FACs are currently just as likely to have Air Force F-16s support them as Marine F/A-18s. Marine infantry battalions are receiving rotary-wing fire support from Army AH-64s in Al-Anbar province as this is written.

The majority of issues outlined in this paper are not new. A review of CAS literature over the last 30 years reveals these same issues in one form or another. The question becomes, then, what is the impetus for resolving these issues? The answer lies in the conflict we face in the global war on terror and the realities of limited resources. JCAS is a reality. The services must embrace this fact to become more effective.

Approaching JCAS from a system standpoint, we have made improvements in many areas. Technology has allowed us to utilize air assets in the CAS role in ways that 20 years ago would have been unthinkable. Terminal attack controller standardization and doctrine updates have allowed us to more effectively apply those technologies during CAS missions. The last area not addressed within the system is aircrews and units performing the mission. The outlined doctrine and training recommendations will complete that step. Ideally, a day will come in the future where the support pro-

vided to the JTAC will be uniform regardless of the platform or service providing it.

Notes

(All notes appear in shortened form. For full details, see the appropriate entry in the bibliography.)

1. Reed, *Army's Transformation Impact*, 8. Reed stated that the joint tactical air control (JTAC) mission "is highly demanding and often complex."

2. Deptula and Dahl, "Transforming Joint Air-Ground Operations," 4. Deptula and Dahl stated that "it takes advanced situational awareness and weapons systems knowledge to both 'rack-and-stack' multiple flights of attack aircraft and choose the correct delivery system and ordnance for desired effects."

3. Grant, "The Clash about CAS."

4. Ibid., 5.

5. Brill, "Close Air Support."

6. US Central Command Air Forces, *Operation Iraqi Freedom*, 5.

7. Government Accounting Office (GAO), *Military Readiness: Lingering Training and Equipment Issues*, 35.

8. Joint Fires Integration and Interoperability Team (JFIIT) Web site. Oversight of joint close air support (JCAS) operations is now the responsibility of JFIIT.

9. Joint Publication (JP) 3-09.3, *Joint Tactics, Techniques, and Procedures for Close Air Support*, I-6.

10. Sherrod, *History of Marine Corps Aviation*, 25.

11. Campbell, *The Warthog*, 39.

12. Ibid., 31.

13. Wolf, *The United States Air Force*, 379.

14. Ibid., 403.

15. Cooling, *Case Studies*, 455.

16. Lawing, "American Armed Forces' Service Culture," 4.

17. Sherrod, *History of Marine Corps Aviation*, 32.

18. Keener, *The Helicopter Innovation*, 13.

19. Wolf, *The United States Air Force*, 403.

20. Field Manual (FM) 3-04.111; and Naval Tactics, Techniques, and Procedures (NTTP), Q-15.

21. JP 3-09.3, *Joint Tactics, Techniques, and Procedures for Close Air Support*, I-1.

22. FM 3-04.111, NTTP, Q-16.

23. Lt Col Jim Adams (Marine Aviation Weapons and Tactics Squadron-1 [MAWTS-1] operations officer), interview by author, March 2005. Lieutenant Colonel Adams served as aircraft maintenance officer for Marine Medium Helicopter Squadron-266, the aviation combat element for the 22nd Marine Expeditionary Unit (MEU-22), which conducted combat operations in support of Operation Enduring Freedom (OEF) in the Tarin Kowt region of Afghanistan, April-July 2004. During these operations, AH-64s were tasked to support MEU operations on several occasions.

24. Grice, "AH-64 Apache Attack Helicopters," 27-30.

25. Lawing, "American Armed Forces' Service Culture," 3.
26. Air Force Doctrine Document (AFDD) 2-1.3, *Counterland Operations*, 36.
27. Author served as a forward air controller and forward air controller (airborne) instructor with MAWTS-1.
28. JP 3-09.3, *Joint Tactics, Techniques, and Procedures for Close Air Support*, III-22.
29. Deptula and Dahl, "Transforming Joint Air-Ground Operations," 4.
30. Author attended the 2004 JCAS conference.
31. Theisen, *Ground-Aided Precision Strike*, 1.
32. Author served as flight lead during Operation Anaconda, 4-26 March 2002.
33. Airborne forward air control (FAC[A]) representatives, interview by author, 2005 Joint Airborne FAC (JFAC[A]) Conference, Yuma, AZ, December 2005.
34. JP 3-09.3, *Joint Tactics, Techniques, and Procedures for Close Air Support*, iii, iv.
35. FAC[A] representatives, interview by author, 2005 joint airborne FAC (JFAC[A]) conference, Yuma, AZ, December 2005.
36. The receive-only video enhanced receiver receives camera images from nearby aircraft and unmanned aerial vehicles (UAV) and integrates them with other US positioning and targeting software to allow the JTAC to view the target from the aircraft sensor perspective.
37. Briefing, Marine Light Attack Helicopter Squadron-773 (HMLA-773), subject: Lessons Learned, MAWTS-1, May 2005. HMLA-773 deployed in support of OEF, October 2003–March 2005.
38. FM 3-04.15, NTTP, II-20. This publication contains target location error categories which refer to the capability of a system to generate target coordinates. The Air Force has derived accuracy estimates based on these categories for various platforms and targeting systems (e.g., F-16 with Sniper pod). These numbers are classified.
39. JP 3-09.3, *Joint Tactics, Techniques, and Procedures for Close Air Support*, I-6.
40. JCAS Action Plan (AP) Memorandum of Agreement (MOA) 2004-01, *Joint Terminal Attack Controller (JTAC) (Ground)*, 2.
41. JCAS AP MOA 2004-02, *Joint Forward Air Controller (Airborne)*, 2.
42. GAO, *Military Readiness Lingering Training and Equipment Issues*, 2.
43. Joint Forces Command (JFCOM) Web site.
44. Author served as AH-1W division operations officer during Weapons and Tactics Instructor courses and Desert Talon exercises with MAWST-1, June 2004–June 2005.
45. MAWTS-1 F/A-18 instructors, interview by author, during training and readiness manual revisions, 2005.
46. Millen, "Improving Detailed Integration," 50.
47. Reed, *Army Transformation's Impact on Close Air Support Terminal Attack Control*, 1.
48. Two-seat F/A-18D aircraft previously were the only fixed-wing aircraft in the Marine Corps inventory to practice the FAC[A] mission. In 2005, the FAC[A] mission was added to the AV-8B and F/A-18C, both single seat aircraft, training and readiness manuals.
49. Marine Corps Center for Lessons Learned, two "Quick Look" reports,

7. AV-8B pilots from Marine Attack Squadron-513 expressed the need for more predeployment training on procedures for employing their targeting pods to detect potential improvised explosive devices.

50. Wolf, *The United States Air Force*, 403.

51. Marine Corps Warfighting Publication 3-23.1, *Close Air Support*.

52. Named after the current Army and Air Force chiefs of staff, respectively.

53. Wolf, *The United States Air Force*, 405.

54. FM 90-21, JAAT Multi-Service Procedures. Joint air attack team operations are defined as coordinated attacks by rotary- and fixed-wing aircraft, normally supported by artillery or naval surface fire support.

55. Pirnie, *Beyond Close Air Support*, 72.

56. Author served as rotary-wing FAC[A] subject-matter expert for MAWTS-1.

57. NTTP 3-22.3-AH1W, *Combat Aircraft Fundamentals, AH-1W (U)*. Chapter 11 of this tactical manual covers rotary-wing FAC[A] tactics, techniques, and procedures for Marine Corps AH-1W and UH-1N helicopters.

58. None of the 2006–2007 Air Force-sponsored research topics deal with close air support. The 2006–2007 list of topics from the Combined Arms Center for Army Command and General Staff College and the School for Advanced Military Studies included “Air-Ground Integration in COIN [Counterinsurgency] Operations.”

59. Col David Larivee notes, in Roberts, *Ground Truth*, 88.

60. Roberts, *Ground Truth*, 16. Roberts notes that during the first five days of operations in Operation Iraqi Freedom, the V Corps commander was hesitant to open killboxes short of the fire support coordination line for fixed-wing interdiction even though there were no friendly forces in the killboxes.

61. FM 90-21, JAAT Multi-Service Procedures, I-2.

62. Author served on Joint FAC[A] Training and Standardization Board, Yuma, AZ, December 2005.

63. Each service has a program designed to provide information to prospective commanders. The Marine Corps Commanders' Program provides information and a course of instruction to enhance their performance as commanders. <http://www.mcu.usmc.mil/mcu/catalog/21cdrprog.pdf>.

64. Briefing, Joint Unmanned Aircraft System Center of Excellence, National Defense Industrial Association, 26 October 2006.

65. Ibid., slide 13. UAVs in JCAS operations is currently issue no. 9 for the JCAS Executive Steering Committee.

66. Roach, “Virginia Blackhawks.”

67. Air Combat Command (ACC) Integrated Training Initiative (ITI) Web site. The ITI is a single-source forum to combine tactics, training, and scheduling from all weapons systems from all joint and multinational services. The ITI consists of both this scheduling Web site and a quarterly conference. The Integrated Training Conference accomplishes training efficiency through a “bottom-up” strategy of comparing/linking schedules from all fighter, bomber, command and control, intelligence, surveillance, reconnaissance, combat search and rescue, tanker, distributed mission operations, air defense artillery, and other assets. In this process, areas of commonality are identified and subsequently “synchronized” into a single training event.

68. ACC Web site. The Combat Air Forces (CAF) Weapons and Tactics Conference is an annual two-week event that brings together hundreds of war fighters from the CAF to discuss current issues, to look at future issues, and to provide solutions for joint employment of forces. New technology is a key area. Attendance is primarily Air Force personnel, but there has been an increasing amount of participation from the Army, Navy, and Marines. The movement focuses on joint war fighting.

69. Author served as MAWTS-1 instructor and flew in AH-64D, F/A-18D, F-16DG, and AH-6M aircraft. This experience provided invaluable insight and experience as a CAS and FAC[A] instructor in the AH-1W.

70. Chairman of the Joint Chiefs of Staff Manual, *Universal Joint Task List*, 3500.04C. Joint mission-essential task lists are developed for units performing specific missions.

71. One pilot interviewed admitted to having never read the JCAS publication while acknowledging that his platform conducted CAS, albeit not as a primary mission.

72. Training and readiness manuals outline the academic and flight training requirements for Marine AH-1W and UH-1N pilots performing CAS. <http://www.tecom.usmc.mil/atb/Training%20and%Readiness.htm>.

73. "Directorate of Evaluation & Standardization," Fort Rucker Command and Directorates Web site.

74. After attending the Air Force Fighter Weapons School or the Marine Weapons and Tactics Instructor course, graduates receive a patch to wear on their flight suits signifying that they have completed the course.

75. Osborn, "Army Tests Apache Networking." http://www.armytimes.com/news/2007/10/defense_apache_071013/. In recent tests, the Army successfully beamed video from unmanned aerial vehicles to an Apache AH-64 Block III attack helicopter in a demonstration. The Tactical Video Link is a similar system tested and approved for funding on the Marine Corps AH-1W.

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